

ENVIRONMENTAL ASSESSMENT

White-tailed Deer Damage Management in Delaware

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List of Acronyms

| | |
|--------|--------------------------------------------------------------------|
| ADC | Animal Damage Control |
| AMDUCA | Animal Medicinal Drug Use Clarification Act |
| APHIS | Animal and Plant Health Inspection Service |
| AVMA | American Veterinary Medical Association |
| BCC | Biological Carrying Capacity |
| CCC | Cultural Carrying Capacity |
| CDC | Center for Disease Control |
| CEQ | Council on Environmental Quality |
| CWD | Chronic Wasting Disease |
| DEA | Drug Enforcement Administration |
| DMP | Deer Management Permits |
| DNREC | Delaware Department of Natural Resources and Environmental Control |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| ESA | Endangered Species Act |
| FAA | Federal Aviation Administration |
| FEIS | Final Environmental Impact Statement |
| HGE | Human granulocytic ehrlichiosis |
| HME | Human monocytic ehrlichiosis |
| IWDM | Integrated Wildlife Damage Management |
| MBTA | Migratory Bird Treaty Act |
| MIS | Management Information Systems |
| MOU | Memorandums of Understanding |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NOA | Notice of Availability |
| NWRC | National Wildlife Research Center |
| SOP | Standard Operating Procedures |
| T&E | Threatened and Endangered (species) |
| USDA | United States Department of Agriculture |
| USFWS | United States Fish and Wildlife Service |
| WS | Wildlife Services (USDA, APHIS) |

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

Within Delaware and across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife that increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1997):

"Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well."

Wildlife Services (WS) is a cooperatively funded, service-oriented program from which other governmental agencies and entities may request assistance. Before any wildlife damage management is conducted, Cooperative Agreements, Agreements for Control or other comparable documents are in place. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently according to applicable federal, State and local laws; and Memorandums of Understanding (MOUs) between WS and other agencies. WS's mission, developed through its strategic planning process, is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* WS's Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- training of wildlife damage management professionals;
- development and improvement of strategies to reduce losses and threats to humans from wildlife;
- collection, evaluation, and dissemination of management information;
- informing and educating the public on how to reduce wildlife damage; and
- providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1999).

Wildlife damage management is the science of reducing damage or other problems caused by wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 1992). WS uses an Integrated Wildlife Damage Management (IWDM) approach, known as Integrated Pest Management (WS Directive 2.1051), in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1:1-7 of USDA (1997). These methods may include alteration of cultural practices, and habitat and behavioral modification to prevent or reduce damage. The reduction of wildlife damage may require that the local populations of offending animal(s) be reduced through lethal means.

This environmental assessment (EA) documents the analysis of the potential environmental effects of a proposed integrated white-tailed deer (*Odocoileus virginianus*) damage management program to alleviate damage to agriculture, property, natural resources, and human health and safety in Delaware. This analysis relies mainly on existing data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997). USDA 1997 may be obtained by contacting the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

The authority for management of resident wildlife species is the responsibility of the Delaware Department of Natural Resources and Environmental Control (DNREC). The DNREC collects and compiles information on white-tailed deer population trends and take, and uses this information to manage deer populations. This information has been provided to WS to assist in the analysis of potential impacts of WS activities on the deer herd in Delaware.

WS is a federal agency authorized to protect American resources from damage associated with wildlife (Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). To fulfill this Congressional direction, WS activities are conducted to prevent or reduce wildlife damage caused to agricultural, industrial and natural resources, property, and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, private organizations, and individuals. Therefore, wildlife damage management is not based on punishing offending animals but as one means of reducing damage and is used as part of the WS Decision Model (Slate et al. 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public. Wildlife Service's vision is to improve the coexistence of people and wildlife, and its mission is to provide Federal leadership in managing problems caused by wildlife.

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions may be

¹ WS Policy Manual - Provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

categorically excluded (7 CFR 372.5(c), 60 Fed. Reg. 6,000- 6,003, (1995)). WS has decided in this case to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed and planned damage management program. All wildlife damage management that would take place in Delaware would be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA). Notice of the availability of this document will be made available consistent with the agency's NEPA procedures.

1.2 Preferred Alternative

Wildlife Services proposes to implement a damage management program that responds to requests for white-tailed deer damage assistance in the State of Delaware. An IWDM approach would be implemented in consultation and coordination with the DNREC to alleviate white-tailed deer damage to agriculture, property, natural resources, and human health and safety on all private and public lands of Delaware where a need exists, assistance is requested from landowners or public officials, and funding is available. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, white-tailed deer, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods (*see* Appendix B) by applying the WS Decision Model (Slate et al.1992). When appropriate, habitat modifications, harassment, repellents, and physical exclusion could be recommended and utilized to reduce deer damage. In other situations, deer would be removed as humanely as possible by sharpshooting and live capture followed by euthanasia under permits issued by the DNREC. In determining the damage management strategy, preference would be given to practical and effective nonlethal methods. However, nonlethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of nonlethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Deer damage management would be conducted in the State, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All deer damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

1.3 Purpose

The purpose of this EA is to address and evaluate the potential impacts to the human environment from the implementation of a WS white-tailed deer damage management program in Delaware. The program is primarily directed to the alleviation of deer damage and conflicts associated with agricultural resources, urban/suburban landscaping, property, natural resources, human safety from deer-vehicle and deer-aircraft collisions, and concerns about the spread of disease. Under the Preferred Alternative (Integrated Deer Damage Management Program), deer damage management could be conducted on

private, federal, state, tribal, county, and municipal lands in the State of Delaware upon request for WS assistance.

1.4 Background and Need for Action

1.4.1 History of White-tailed Deer Management in Delaware

White-tailed deer inhabited all of Delaware and eastern North America before the arrival of European immigrants (Trefethan 1970). Deer were an important resource to the Native Americans who hunted deer year-round. In Delaware, gray wolves and mountain lions also preyed on white-tailed deer. The first European settlers in Delaware hunted the white-tailed deer for meat and hides to provide them with food and clothing.

As the colony prospered and human populations multiplied, the demand for products provided from deer grew as well. The unregulated market hunting that was occurring and the destruction of habitat (deforestation) caused deer populations to decline drastically throughout the 1700s (McCabe et al. 1984). Market hunters sold deer meat to colonists and shipped deer hides to England's large leather industry. As settlements expanded across the state during the 1800s, deer populations continued to drop. By 1900, it was rare to see a deer in Delaware.

Since the birth of wildlife management in the early 1900s, Delaware's deer population has steadily expanded (Per Comm. DNREC Deer Project Staff 2006). There are no records of Delaware having restocked deer to restore the population as was done in other states. Deer are thought to have repopulated Delaware through immigration from other states during the time when deer hunting was not allowed. Deer numbers grew steadily during the early to mid 1900's (Per Comm. DNREC Deer Project Staff 2006). In 1953, the Delaware Board of Game and Fish Commissioners was given the authority to set seasons and bag limits for most forms of wildlife. Delaware's first deer season in 113 years opened on New Year's Day 1954 (Per Comm. DNREC Deer Project Staff 2006). The 3 day hunt resulted in a harvest of 505 animals. As deer numbers continued to grow, seasons and bag limits were liberalized and an emphasis placed on harvesting does to control population growth.

Since white-tailed deer thrive in habitat that is composed of woods and openings, the expansion of housing developments into forests or onto farms provides excellent white-tail habitat. Streets and home sites created in a wooded area produce habitat preferred by white-tailed deer. Open farm fields become better deer habitat as new homeowners' plant trees and shrubs on their bare home site. Deer populations have escalated in these suburban landscapes where exceptional habitat is available and hunting is limited. By the mid 1980's, deer numbers had grown to where severe damage was occurring to both suburban landscaping and agricultural crops (Per. Comm. DNREC Deer Project Staff 2005).

1.4.2 Ecology, Behavior and Population Status

The white-tailed deer is one of the most ubiquitous and well-known wild animals in Delaware, and its large population has a huge effect on other kinds of wildlife and on the natural environment as a whole (Fergus 2000). In Delaware, the average adult male

(buck) weighs 140 pounds (117 pounds field dressed) and stands about 33 inches at the shoulder. A typical deer is 70 inches from the tip of its nose to the base of its tail. Females (does) are smaller and weigh less than males. Deer weights vary considerably, depending on age, sex, diet, and season of the year (Fergus 2000, Per. Comm. DNREC Deer Project Staff 2005).

Male deer have antlers that are made of bone and are connected to the skull. Antlers begin developing in March or April. They are covered by a layer of skin, the velvet, richly supplied with nutrient-carrying blood vessels. In August or early September, antler growth stops, the velvet is shed, and the buck carries his antlers throughout the fall breeding season. As the buck's testosterone levels dwindle, a separation layer forms between the antlers and skull. In January or February the antlers fall off and the buck grows new antlers each year (Fergus 2000). Antler growth is based on several factors; genetics, age of the deer, and food quantity and quality. Typically, bucks with larger antlers are more pleasing to the public for aesthetic reasons or for recreational purposes.

Deer are strictly plant eaters. Deer eat leaves and twigs from a vast assortment of woody plants, including aspen, ash, beech, birch, dogwood, maple, oak, willow, witch hazel, pine, and hemlock (Fergus 2000). Deer grub out the corms of ferns, nibble on lichens, strip bark from trees, and consume lily pads and pond plants. Deer eat garden vegetables, wild mushrooms, fruits such as apples and pears, and crops, including soybeans, corn, and alfalfa. Acorns are a favorite food, and deer consume them in great quantities when putting on fat for winter. A deer will eat 5 to 9 pounds of food daily (Fergus 2000).

Deer breed from October to January. The rut peaks in mid- to late November, and most adult females have been bred by the end of December. Most does bear their fawns from late May to early June, after approximately two hundred days of gestation. Year-old does may have one fawn, and older does generally have twins and, sometimes, triplets. Fawns weigh 4 to 8 pounds at birth. They nurse almost immediately and can walk within an hour (Fergus 2000).

An ideal habitat is brush-stage forest with a wide variety of tree and plant species. White-tailed deer are highly adaptable and live in many habitats, including woodlots in farming country, suburbs, and deep woods. Deer live out their entire lives in the same home range, about 40 acres in good habitat to over 300 acres in marginal habitat. Mature bucks usually have larger home ranges than those of does and younger deer (Fergus 2000).

The biological carrying capacity (BCC) of a wildlife population is defined as the maximum number of animals that an area can support without degradation to the animal's health and the environment over an extended period of time. When this number is exceeded, the health of the population begins to suffer, reproduction declines, parasitism and disease increase, and habitat quality and diversity decrease due to overbrowsing of plant species preferred as food by deer (Kroll et al. 1986). Overbrowsing negatively impacts the habitat and landscape, and overall animal health declines due to less nutritious food items being available.

The cultural carrying capacity (CCC) is defined as the maximum density of a given species that can coexist compatibly with the local human population (Decker and Purdy 1988). This term is useful because it defines when conflicts with deer have exceeded an acceptable level, and provides managers with a target for establishing management objectives. Certain factors may influence the CCC, such as landscape or vegetation impacts, threats to public safety, the potential for illegal killing of deer, and personal attitudes and values. The threshold of wildlife damage acceptance is a primary limiting factor in determining the CCC.

For any given damage situation, there will be varying acceptance thresholds by those directly, as well as indirectly, affected by the damage. Both the CCC and BCC are important factors in managing conflicts between humans and deer.

In 2005, the estimated white-tailed deer population in Delaware was 30,000 deer (Per. Comm. DNREC Deer Project Staff 2005). This estimate was calculated based on harvest statistics gathered over a several year period. Currently, deer populations in most management zones in Delaware are higher than DNREC desires. Hunting seasons continue to be liberalized to increase the harvest of does.

1.4.3 Harvest Information for Deer in Delaware

Deer hunting seasons and regulations are currently uniform throughout the state. Delaware is in the process of developing a statewide deer management plan and will be evaluating the possibility of differential regulations based on deer management zones. The following is a breakdown of the 2005-2006 Delaware deer hunting season.

Archery: Statewide, Sept. 1 – January 31. Bow hunters are required to wear hunter orange when dates coincide with gun seasons. Crossbows are legal during the November gun season (starting on the first Monday) and during all other gun seasons in December and January. Crossbow permits are also available for disabled hunters and can be used during all archery deer seasons.

Shotgun: Special antlerless days – Oct. 1, Oct. 17, Oct. 22-22, Oct, 24, Oct. 28-29, Dec. 10-17. Any deer days – Nov. 11-19, Jan. 14-21

Muzzleloader: Oct. 7 – 15, Jan. 23-28

Hunters receive 2 antlerless tags and 2 doe tags with their hunting license. A separate resident hunter combination hunter's choice and quality buck tag can be purchased for \$10. Non-residents can purchase a separate antlered tag or quality buck tag for \$25 each. Additional antlerless tags can be purchased by all hunters for \$10 each. Landowners enrolled in the deer damage assistance program receive unlimited antlerless deer tags.

During Delaware's 2004-2005 hunting season, 14,584 deer were harvested throughout the State. Fifty-nine percent of those were female deer.

1.4.4 Deer Damage to Agriculture

The estimated economic loss from deer depredation to high-value agricultural crops for 1996 in Delaware was \$375,966 (Drake et. al 2003). High-value agricultural crops included fresh market and processed vegetables, including but not limited to snap beans, sweet corn, leafy vegetables, tomatoes, and peppers. Apples and peaches were also included as high-value crops (Drake et. al 2003). The estimated economic loss from deer depredation to grain crops for 1996 in Delaware was \$867,937 (Drake et. al 2003). Grain crops included corn (silage and grain), soybeans, wheat, and oats (Drake et. al 2003).

1.4.5 Deer-Vehicle Collisions

Deer-vehicle collisions are a serious concern nationwide because of losses to property and the potential for human injury and death (Conover 1997, Conover et al. 1995, Romin and Bissonette 1996). The economic costs associated with deer-vehicle collisions include vehicle repairs, human injuries and fatalities, and picking up and disposing of deer (Drake et. al 2003). Conover et. al (1995) estimated that more than 1 million deer-vehicle collisions occur annually in the United States, costing over \$1.1 billion in repair costs, and resulting in 29,000 human injuries and 211 human fatalities. The estimated annual total cost to repair vehicle damage from deer-vehicle collisions from 1986-2000 in Delaware was \$462,000 (Drake et. al 2003).

Often, deer-vehicle collisions in which a deer carcass was not recovered or little vehicle damage occurred go unreported. A Cornell University study estimates that the actual number of deer-vehicle collisions could be as high as six times the reported number (Decker et al. 1990). As Keith McCaffery (a retired deer biologist from Wisconsin) put it; "Seeing deer in the forest used to be a magical experience, now it's exciting only if they're coming through your windshield (Ness 2003).

1.4.6 Deer Hazards at Airports

Airports provide ideal conditions for feeding and bedding sites for deer due to the large grassy areas adjacent to brushy, forested habitat used as noise barriers. Deer living within airport boundaries are usually protected from hunting and many other human disturbances.

Deer-aircraft strikes can result in loss of human life, injury to passengers or people on the ground, damage or malfunction of aircraft, aircraft navigational aids, or airport facilities. Mammals colliding with aircraft during the most vulnerable phases of flight, takeoff or landing, can cause the aircraft to crash or sustain physical damage (USDA 1998). Mammals are characteristically unpredictable in their initial response to approaching aircraft. Deer may wander onto runway surfaces and be startled into the path of oncoming aircraft, and at night, they may freeze when caught in the beams of landing lights, resulting in a strike. The majority of deer strikes occur at night and in the fall during the mating season (Dolbeer et al. 1995).

White-tailed deer are a commonly encountered problem at airfields in Delaware, threatening the safe operation of aircraft at those facilities. Collisions between deer and aircraft can cause major damage to the aircraft, and potentially cause injury and loss of human life. Serious consequences are also possible if pilots lose control of the aircraft while attempting to avert a collision with deer. From 1990 through 2000 there were 500

reported deer-aircraft strikes to civil aircraft in the U. S. (reporting is not mandatory and it is estimated that less than 20% of strikes are reported) (USDA 1998).

The risk that deer pose to aircraft is well documented; the following are just a few examples of deer/aircraft strikes:

- On November 17, 1998, a private jet with 30 passengers was departing from Elko Nevada, when the bottom of the engine cowling struck a white-tailed deer, knocking off an antler. The entire antler was sucked into the engine forcing the plane to circle the airfield and land. The passengers were safely off-loaded, but the engine was destroyed. Damage was estimated at \$300,000 (USDA 1998).
- On March 2, 1998, a Jetstream commuter in Johnstown, Maryland, collided with multiple white-tailed deer which caused the left main mount to collapse and the aircraft to lose control and roll off the runway with ten passengers and crew on board. The incident required emergency procedures and demonstrated the seriousness of the deer-aircraft collision hazard to public safety (USDA 1998).
- On January 11, 1990, a Hawker Siddeley struck several deer during take off in Tennessee. One of the deer was completely ingested into the left engine. The impact tore the engine loose from the aircraft. The aircraft was replaced at a cost of 1.4 million dollars (Cleary et. al 2002).
- On January 2, 1992, a Piper 28 in Minnesota collided with a deer just prior to touchdown. The pilot added power and aborted the landing. Loss of engine power was experienced during the climb and the aircraft crashed into trees then the ground a ¼ mile south of the airport. The pilot was seriously injured and the aircraft was destroyed (Cleary et. al 2002).
- On December 6, 2000, an Embraer 120 in West Virginia collided with two deer just after landing. The tip of a propeller blade separated and punctured the fuselage, injuring a passenger, who later died (Cleary et. al 2002).

Bird and mammal strikes to aircraft have been reported in all 50 states. From 1990-2003, the Federal Aviation Administration (FAA) received reports of 21 mammal strikes that resulted in 29 human injuries and 1 fatality. Deer were responsible for 7% of these mammal strikes that resulted in death or injury (FAA 2004). From 1990-2003, there were 614 deer-aircraft strikes to civil aircraft that resulted in damage (574 strikes involving white-tailed deer) with reported costs totaling \$21.7 million (FAA 2004). Deer strikes have occurred at Delaware airports resulting in the DNREC issuing permits to remove deer from these locations (Per Comm. DNREC Deer Project Staff 2006).

1.4.7 Damage to Landscaping and Natural Resources

Deer are considered a “keystone species,” one that can have a profound impact on vegetation, altering species composition to the point that entire forests either fail to regenerate, or regenerate with tree species that are not beneficial for deer or other species

of wildlife, or for lumber (Wallingford 2002). Deer browsing damages and destroys landscaping and ornamental trees, shrubs, and flowers. As rural areas are developed, deer habitat may actually be enhanced because fertilized lawns, gardens, and landscape plants serve as high quality sources of food (Swihart et al. 1995). Furthermore, deer are prolific and adaptable, characteristics that allow them to exploit and prosper in most suitable habitat near urban areas, including residential areas (Jones and Witham 1990). The succulent nature of many ornamental landscape plants, coupled with high nutrient contents from fertilizers, offers an attractive food source for deer. In addition to browsing pressure, male white-tailed deer damage ornamental trees and shrubs by antler rubbing which results in broken limbs and bark removal. While large trees may survive antler-rubbing damage, smaller saplings often die or become scarred to the point that they are not aesthetically acceptable for landscaping.

Deer overabundance can affect native vegetation and natural ecosystems in addition to ornamental landscape plantings. White-tailed deer selectively forage on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). These changes can lead to adverse impacts on other wildlife species, which depend on these plants for food and/or shelter. Numerous studies have shown that over browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991). By one count, 98 species of threatened and endangered plants, many of them orchids and lilies, are disturbed by deer browsing (Ness 2003). In the Great Smokey Mountains National Park in Tennessee, an area heavily populated by deer had a reduction in the number of plant species, a loss of hardwood species and a predominance of conifer species compared to an ecologically similar control area with fewer deer (Bratton 1979). In a single park in Columbus, Ohio, a deer herd eradicated more than 150 plant species (Ness 2003).

The alteration and degradation of habitat from over-browsing by deer can have a detrimental effect on deer herd health and may displace other wildlife communities (e.g., neotropical migrant songbirds and small mammals) that depend upon the understory vegetative habitat destroyed by deer browsing (VDGIF 1999). Similarly, DeCalesta (1997) reported that deer browsing affected vegetation that songbirds need for foraging surfaces, escape cover, and nesting. Species richness and abundance of intermediate canopy nesting songbirds was reduced in areas with higher deer densities (DeCalesta 1997). Intermediate canopy-nesting birds declined 37% in abundance and 27% in species diversity at higher deer densities. Five species of birds were found to disappear at densities of 38.1 deer per square mile and another two disappeared at 63.7 deer per square mile. Casey and Hein (1983) found that 3 species of birds were lost in a research preserve stocked with high densities of ungulates and that the densities of several other species of birds were lower than in an adjacent area with lower deer density. Waller and Alverson (1997) hypothesize that by competing with squirrels and other fruit-eating animals for oak mast, deer may further affect many other species of animals and insects.

1.4.8 Threats to Human and Livestock Health and Safety from Disease Transmission

Lyme Disease: Currently, the most common zoonosis involving deer is Lyme disease, caused by the spirochete *Borrelia burgdorferi* and vectored to humans by the deer tick (*Ixodes dammini* in the eastern U.S.) (Conover 1997). Initial symptoms of Lyme disease include a flu-like illness with headache, fever, muscle or joint pain, neck stiffness, swollen glands, jaw discomfort, and inflammation of the eye membranes (McLean 1994). If left untreated, heart, nervous system, and joint manifestations may develop (McLean 1994).

Research has shown a correlation between infected ticks, deer numbers, and Lyme disease cases (Deblinger et al. 1993, Magnarelli et al. 1984). Deer are an important reservoir for Lyme disease and are the primary host for the adult deer tick (Conover 1997). The Montgomery County Health Department (MCHD), Pennsylvania cites that Lyme disease incidence has also been linked to landscape features such as wooded, residential areas versus developed, urban areas (MCHD 2000). In 2002, a total of 23,673 cases of Lyme disease were reported to the Center for Disease Control (CDC). Ninety-five percent of these cases were from Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Wisconsin (CDC 2004). Delaware began Lyme Disease surveillance in 1988 with 5 cases reported. In 2003, 212 cases were reported (Delaware Dept. of Public Health 2003).

In 1986, another serious tick-borne zoonosis, human ehrlichiosis, was discovered in the United States (McQuiston et al. 1999). Two distinct forms of the illness may affect humans: human monocytic ehrlichiosis (HME) and human granulocytic ehrlichiosis (HGE) (McQuiston et al. 1999, Lockhart et al. 1997). The bacterial agents that cause ehrlichiosis are transmitted to humans by infected ticks that acquire the agents from feeding on infected animal reservoirs (McQuiston et al. 1999). Ehrlichiosis in humans may result in fever, headache, myalgia, nausea, and occasionally death (McQuiston et al. 1999, Little et al. 1998). HME is the type of ehrlichiosis predominantly found in the southeastern, south-central, and mid-Atlantic U.S. White-tailed deer are major hosts for *Amblyomma americanum*, the tick that transmits HME, and deer have been identified as a reservoir for HME (Little et al. 1998, Lockhart et al. 1997).

Bovine Tuberculosis: Tuberculosis (TB) is a contagious disease of both animals and humans and can be caused by three specific types of the *Mycobacterium* bacteria. Bovine TB, caused by *Mycobacterium bovis*, primarily affects cattle and other bovine-like animals (e.g., bison, deer, and goats) but can be transmitted to humans and other animals.

Pathogenesis of *M. bovis* infection in white-tailed deer begins with either inhalation or ingestion of infectious organisms. Transmission is aided by high deer density and prolonged contact, as occurs at supplemental feeding sites. The bacilli commonly invade the tonsil first, later spreading to other cranial lymph nodes. If the infection is contained, it spreads no further. In some animals the infection spreads to the thorax where it may disseminate throughout the lungs; these animals may then shed the bacteria by aerosol or oral secretions. The most susceptible animals develop disseminated infections

throughout their abdominal organs, and can even shed bacilli through their feces or through their milk to their fawns.

Bovine TB has affected both animal and human health for years. During the early part of the 20th century the disease affected more U.S. farm animals than did all other infectious diseases combined. The USDA Cooperative State-Federal Tuberculosis Eradication Program, which began in 1917, is chiefly responsible for the near-eradication of the disease from the nation's livestock population.

The only state with documented significant levels of Bovine TB in white-tailed deer is Michigan. This high rate of TB in Michigan is due to an artificially high density of deer in close association at winter food dumps provided for the deer herds. High deer densities most often occur when the amount of naturally available foods is supplemented, such as in urban or suburban environments or in cases such as Michigan.

Foot and Mouth Disease: There are no known cases of Foot and Mouth Disease in the United States. Foot and Mouth Disease is a highly contagious viral disease that affects domestic cattle, sheep, pigs, and goats. Deer are a known vector of this disease.

The disease causes blisters which produces chronic lameness, weight loss, and decreased production, and can cause abortions and sterility. The incubation period for foot and mouth is 2 to 16 days. It is rarely fatal; however, it can cause severe economic losses from reduced production and the ability to export products (CDC 2003).

Chronic Wasting Disease: Chronic wasting disease (CWD) is a neurological disease found only in cervids (members of the deer family) in North America. The disease belongs to a family of diseases known as transmissible spongiform encephalopathies (TSE). The disease attacks the brain of infected animals and produces small lesions that result in death. CWD has not been found in Delaware. Efforts to detect CWD in Delaware deer began in 2003 with 100 hunter killed deer tested from each county (Per. Comm. DNREC Deer Project Staff 2005). An additional 100 deer from each county were tested in 2004. In 2005, the sample size was increased to 200 deer from each county. CWD has been identified in captive or wild deer or elk in Colorado, Wisconsin, Nebraska, Kansas, Montana, South Dakota, New Mexico, Utah, Illinois, Oklahoma, New York and West Virginia as well as in the Canadian province of Saskatchewan.

MD/DE/DC WS would submit a percentage of the deer killed during damage management activities for CWD testing. This testing could be expanded to testing for TB, Foot and Mouth Disease, and Hemorrhagic Fever at the request of the DNREC.

1.5 Operational Framework for Deer Damage Management in Delaware

The potential for deer populations to exceed carrying capacity can negatively effect plant and animal species, conflict with land-use practices, and increase risk to human health and safety, any of which would necessitate effective deer damage management. Financial and logistical constraints require that deer management programs be practical and fiscally responsible.

1.5.1 Wildlife Services Objectives

- In consultation with the DNREC, respond to requests for assistance with the appropriate action (technical assistance or direct control) as determined by MD/DE/DC WS personnel, applying the ADC Decision Model (Slate et al. 1992).
- Hold the lethal take of nontarget animals by WS personnel during deer damage management to zero.

1.5.2 Relationship of this EA to Other Environmental Documents

Wildlife Services Programmatic Environmental Impact Statement. WS conducted a NEPA process and developed a Final Environmental Impact Statement (FEIS) on the national APHIS/WS program (USDA 1997). The FEIS contains detailed discussions of potential environmental impacts from various wildlife damage management methods. Pertinent information available in the FEIS has been incorporated by reference into this EA. The FEIS may be obtained by contacting: USDA APHIS WS Operational Support Staff, 4700 River Rd., Unit 87, Riverdale, MD 20737-1234.

1.5.3 Decisions to be Made

Based on the scope of this EA, the decisions to be made are:

- Should WS conduct white-tailed deer damage management in Delaware to alleviate damage to agriculture, property, natural resources, and human health and safety?
- Should WS implement an integrated wildlife damage management strategy, including technical assistance and direct control, to meet the need for white-tailed deer damage management in Delaware?
- If not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA?
- Would the Preferred Alternative have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.6 Scope of this Environmental Assessment Analysis

1.6.1 Actions Analyzed

This EA evaluates white-tailed deer damage management by WS to protect human health, human safety, property, natural resources and agriculture on private land or public facilities whenever or wherever such management is requested from the WS program in Delaware.

1.6.2 American Indian Lands and Tribes

Currently WS does not have any MOUs or signed agreements with any American Indian tribe in Delaware. If WS enters into an agreement with a tribe for white-tailed deer damage management, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA.

1.6.3 Period for which this EA is Valid

This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WS state white-tailed deer damage management activities.

1.6.4 Site Specificity

This EA analyzes the potential impacts of white-tailed deer damage management and addresses activities on all private and public lands in Delaware under MOU, Cooperative Agreement, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of deer damage management on areas where additional agreements may be signed in the future. Because the Preferred Alternative is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional wildlife damage management efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of deer damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where deer damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever deer damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Delaware (*see* Description of Alternatives for a description of the Decision Model and its application).

The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within Delaware. In this way, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.6.5 Public Involvement/Notification

As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.7 Authority and Compliance

1.7.1 Authority of Federal and State Agencies in White-tailed Deer Damage Management in Delaware

See Chapter 1 of USDA (1997) for a complete discussion of federal laws pertaining to WS.

1.7.1.1 WS Legislative Authority

The USDA is authorized by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c), which provides that:

The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "*bringing (damage) under control*," rather than "*eradication*" and "*suppression*" of wildlife populations. In 1988, Congress strengthened the legislative authority of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with states, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."

1.7.1.2 Delaware Department of Natural Resources and Environmental Control (DNREC) Legislative Authority

The Delaware Department of Natural Resources and Environmental Control (DNREC), under the direction of the Wildlife Advisory Commission, is specifically charged by the General Assembly with the management of the state's wildlife resources. The primary statutory authorities include the protection, reproduction, care, management, survival, and regulation of wild animal populations regardless of whether the wild animals are present on public or private property in Delaware.

The DNREC has authority to manage deer in the State of Delaware under Title 7-102. Under Title 7-113 and 114, the DNREC has the authority to permit the taking of deer to resolve damage problems covering this proposed action. Furthermore, under Title 7-555 the DNREC may issue permits for scientific collection purposes.

1.7.2 Compliance with Other Federal Laws

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.7.2.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Delaware. When WS direct management assistance is requested by another federal agency, NEPA compliance is the responsibility of the other federal agency. However, WS could agree to complete NEPA documentation at the request of the other federal agency.

1.7.2.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that *"any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available"* (Sec.7(a)(2)). WS obtained a Biological Opinion from the U.S. Fish and Wildlife Service (USDI 1992) describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F). WS is in the process of initiating formal consultation at the programmatic level to reevaluate the 1992 B.O. and to fully evaluate potential effects on T&E species listed or proposed for listing since the 1992 USFWS BO.

1.7.2.3 National Historic Preservation Act (NHPA) of 1966 as amended

The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that has the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (i.e. State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

Each of the deer damage management methods described in this EA that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual,

atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

There is potential for audible effects on the use and enjoyment of a historic property when methods such as firearms, or other noise-making methods are used at or in close proximity to such sites for purposes of hazing or removing animals. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

1.7.2.4 Environmental Justice and Executive Order 12898—“*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Population*”

Executive Order 12898, entitled, “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations” promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. It is a priority within APHIS and WS. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minorities and persons or populations of low income. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the Preferred Alternative would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income. Additionally, the donation of venison to charitable organizations would be a benefit to the economically disadvantaged, and to other persons in need.

1.7.2.5 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal

might have on children. The proposed white-tailed deer damage management program would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

1.7.2.6 The Native American Graves and Repatriation Act of 1990.

The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

1.7.2.7 Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360).

This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration.

1.7.2.8 Controlled Substances Act of 1970 (21 U.S.C. 821 et seq.).

This law requires an individual or agency to have a special registration number from the federal Drug Enforcement Administration (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

1.7.2.8 Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA).

The AMDUCA and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs. Those requirements are: (1) a valid “veterinarian-client-patient” relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period of time after a drug is administered that must lapse before an animal may be used for food) for specific drugs. Animals that might be consumed by a human within the withdrawal period must be identified; the Western Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies has recommended that suitable identification markers include durable ear tags, neck collars, or other external markers that provide unique identification (WWHC undated). APHIS-WS establishes procedures in each state for administering drugs used in wildlife capture and handling that must be approved by state veterinary authorities in order to comply with this law.

CHAPTER 2: AFFECTED ENVIRONMENTS AND ISSUES

2.1 Affected Environments

The areas of the proposed action include, but are not limited to, property on or adjacent to airports, recreational areas, parks, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, and cemeteries. The proposed action may be conducted on properties held in private, local, state or federal ownership.

2.1.1 Airports

Of all mammal species, deer are ranked as the most hazardous to aircraft, especially to smaller general aviation aircraft (Dolbeer et al. 2000), and they represent a serious threat to human health and safety. Airports are often secured areas with chain-link security fencing. Sometimes deer gain entrance into these airports where there is adequate cover and food, and they live there for all or part of the year. Because deer are ubiquitous throughout Delaware, it is possible for deer to be present at nearly any airport in the state.

2.1.2 Properties where federal research laboratories are located

Federal property containing research facilities are usually controlled access areas with security fencing. These same properties often are unconcerned with the presence of deer until the herd is large enough to impact the horticulture present and the health of the herd itself. When herds of unhealthy sizes occur on federal properties, USDA WS may be called upon to reduce their sizes.

2.1.3 Urban and suburban and rural areas

Other areas include farms and rural areas where deer are causing damage to agriculture through feeding and antler rubbing and potentially to livestock through the spread of disease. Public and private properties in rural and urban/suburban areas may also be affected where deer cause damage to landscaping, to natural resources, by vehicle collisions, and through threats to human health and safety from disease transmission.

2.1.4 The "Environmental Status Quo" for managing damage and conflicts associated with State managed or unprotected wildlife species

As defined by NEPA implementing regulations, the "*human environment* shall be interpreted comprehensively to include the natural and physical environment *and the relationship of people with that environment.*" (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "human environment," it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or will occur in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with State-resident wildlife species or unprotected wildlife species.

Unprotected wildlife species, such as most non-native invasive species, are not protected under state or federal law. Most State-resident wildlife species are managed under State authority or law without any federal oversight or protection. In some states, with the possible exception of restrictions on methods (e.g., firearms restrictions, pesticide regulations), unprotected wildlife species and certain resident wildlife species are

managed with little or no restrictions allowing them to be killed or taken by anyone at any time. For white-tailed deer damage management in Delaware, the DNREC has the authority to manage and authorize the taking of white-tailed deer for damage management purposes (see section 1.7.1.2).

When a non-federal entity (i.e. State wildlife agencies, State agriculture agencies, State health agencies, municipalities, counties, private companies, individuals, etc.) takes a management action on a State-resident wildlife species or unprotected wildlife species, the action is not subject to NEPA compliance due to the lack of federal involvement in the action. Under such circumstances, the environmental *baseline* or *status quo* must be viewed as an environment that includes those species *as they are managed or impacted by non-federal entities in the absence of the federal action being proposed*. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards a state protected or unprotected wildlife species will occur and even the particular methods that will be used, WS's involvement in the action will not affect the *environmental status quo*. WS's decision-making ability is restricted to one of two alternatives - either taking the action using the specific methods as decided upon by the non-federal entity, or taking no action at all at which point the non-federal entity will take the same action anyway.

The inability to change the *environmental status quo* in the types of situations described above presents a clear question of whether there is enough federal control over the action to be taken to make direct assistance by WS a federal action requiring compliance with the National Environmental Policy Act. This lack of federal control over the decision to be made is even clearer when the non-federal entity has committed to taking the same actions in the absence of any federal assistance from WS. Clearly, under these circumstances, by any analysis we can envision, WS would have virtually no ability to affect the *environmental status quo* by selecting any possible alternative, even the alternative of no federal action by WS.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal cooperator has obtained the appropriate DNREC permit or authority, and has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, however, certain aspects of the human environment may actually benefit more from WS's involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity; WS management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

2.2 Issues Analyzed in Detail

The following issues have been identified as areas of concern requiring consideration in this environmental assessment:

2.2.1 Effects on White-tailed Deer Populations

There are concerns that the Preferred Alternative or any of the alternatives would result in the loss of local white-tailed deer populations or could have a cumulative adverse impact on statewide populations. In 2005, the estimated white-tailed deer population in Delaware was 30,000 deer and the population is increasing (Per. Comm. DNREC Deer Project Staff 2005).

MD/DE/DC WS expects that no more than 600 deer would be lethally removed annually, under permits issued by the DNREC, while conducting WS direct control activities within the state. However, in the event of a disease outbreak (Foot and Mouth or CWD) WS could kill up to 2,000 deer (at the request of the DNREC). Therefore, 2,000 deer was used to analyze WS potential impacts to the statewide deer population in Delaware. During Delaware's 2004-2005 hunting season, 14,584 deer were harvested throughout the State. Fifty-nine percent of those were female deer. In 2005, 2230 deer were killed under DNREC issued depredation permits to non-WS entities.

2.2.2 Effects on Plants and other Wildlife Species, including Threatened and Endangered Species

There are concerns among members of the public and wildlife professionals, including WS, that there is the potential for control methods used in the Preferred Alternative or any of the alternatives to inadvertently capture or remove nontarget animals or potentially cause adverse impacts to nontarget species populations, particularly T&E species. WS's standard operating procedures include measures intended to mitigate or reduce the effects on nontarget species populations and are described in other sections of this EA. To reduce the risks of adverse affects to nontarget species, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of negatively effecting nontarget species.

Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act concerning potential impacts of deer damage management control methods on T&E species and has obtained a Biological Opinion. For the full context of the Biological Opinion, see Appendix F of the ADC FEIS (USDA 1997).

Some people are concerned about the damaging effects that deer are having on native flora and fauna, and on the recovery of state and federally listed Endangered and Threatened species, and species of concern. These people are concerned as to whether the Preferred Alternative or any of the alternatives would reduce such damage to acceptable levels.

2.2.3 Effects on Human Health and Safety

A common concern is whether the Preferred Alternative or any of the alternatives pose an increased threat to human health and safety. In particular, there is concern that the methods of deer removal (i.e., trapping and sharpshooting) may be hazardous to people. Another concern is that high deer populations pose a threat to human health and safety

through the potential for deer-vehicle collisions, deer-aircraft collisions, and the spread of disease.

Firearm use is sensitive and a public concern because of safety issues relating to the public and firearms misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety-and-use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees, who use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

2.2.4 Humaneness of methods to be used

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Kellert and Berry (1980) in a survey of American attitudes toward animals related that 58% of their respondents, "*... care more about the suffering of individual animals ... than they do about species population levels.*" Schmidt (1989) indicated that vertebrate pest control for societal benefits could be compatible with animal welfare concerns, if "*... the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*"

Suffering has been described as a "*... highly unpleasant emotional response usually associated with pain and distress.*" However, suffering "*... can occur without pain ...*," and "*... pain can occur without suffering ...*" (American Veterinary Medical Association (AVMA) 1986). Because suffering carries with it the implication of a time frame, a case could be made for "*... little or no suffering where death comes immediately ...*" (California Department of Fish and Game 1991), such as the WS technique of shooting.

Defining pain as a component of humaneness may be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "*... probably be causes for pain in other animals ...*" (AVMA 1986). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). Some WS damage management methods such as traps, may thus cause varying degrees of pain in different animal species for varying time frames. At what point pain diminishes or stops under these types of restraint has not been measured by the scientific community.

Pain and suffering as it relates to a review of WS damage management methods to capture animals, has both a professional and lay point of arbitration. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since "*... neither medical or veterinary curricula explicitly address suffering or its relief*" (CDFG 1991).

Research suggests that with some methods, such as restraint in traps, changes in the blood chemistry of trapped animals indicate "*stress*" (USDA 1997: 3-81). However, such

research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans if damage management methods were not used. Therefore, humaneness appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of suffering with the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management devices through research and is striving to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in those situations when non-lethal damage management methods are not practical or effective.

MD/DE/DC WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology and funding. Standard Operating Procedures used to maximize humaneness are listed in this EA. As appropriate, WS euthanizes live animals by methods recommended by the AVMA (Beaver et al. 2001) or the recommendations of a veterinarian, even though the AVMA euthanasia methods were developed principally for companion animals and slaughter of food animals, and not for free-ranging wildlife.

2.2.5 Effects on Aesthetic Values

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception and today a large percentage of households have pets. However, some people may consider individual wild animals and birds as “pets” or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

There is some concern that the Preferred Alternative or the other alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the

personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

MD/DE/DC WS recognizes that all wildlife has aesthetic value and benefit. WS only conducts deer damage management at the request of the affected home/property owner or resource manager. If WS received requests from an individual or official for deer damage management, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.2.6 Effects on Regulated White-tailed Deer Hunting

Some people may be concerned that deer removal activities conducted by WS would affect regulated deer hunting by drastically reducing local deer populations. WS deer removal activities would primarily be conducted on populations and in areas where hunting access is restricted or has been ineffective. In fact, lethal, management pressure applied to deer in these populations could serve to drive deer from these areas to places accessible to hunters. Further, the magnitude of the impact WS's activities will have on the deer population is considered low (see section 4.2, Alternative 5).

2.3 Issues Not Considered in Detail With Rationale

2.3.1 WS' Impact on Biodiversity

No MD/DE/DC WS deer damage management is, or will be, conducted to eradicate a native wildlife population. WS operates according to international, federal, and state laws and regulations enacted to ensure species viability. In addition, any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. The impacts of the current WS program on biodiversity are minor and not significant nationwide, statewide, or region wide (USDA 1997). WS operates on a small percentage of the land area of the State, and the maximum WS take of any wildlife species analyzed in this EA is a small percentage of the total population and is insignificant to the viability and health of the population.

2.3.2 Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area

Some individuals might question whether preparing an EA for an area as large as the State of Delaware would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the Preferred Alternative would have a

significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones. In addition, MD/DE/DC WS only conducts deer damage management in small areas of the State where damage is occurring or likely to occur.

CHAPTER 3: ALTERNATIVES

3.1 Introduction

This chapter consists of 6 parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including Alternative 5 (the Preferred Alternative), 3) a description of Integrated Wildlife Damage Management, 4) deer damage management methods available for use or recommendation by WS in Delaware, 5) alternatives considered but not in detail, with rationale, and 6) standard operating procedures (SOPs) for deer damage management.

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), “*Methods of Control*” (USDA 1997, Appendix J), and the “*Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program*” (USDA 1997, Appendix P).

The No Action alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with the Council on Environmental Quality’s (CEQ’s) definition (CEQ 1981).

The five alternatives analyzed in detail are:

- Alternative 1 – No Deer Damage Management by WS
- Alternative 2 – Technical Assistance Only (No Action Alternative)
- Alternative 3 – Lethal Deer Damage Management only by WS
- Alternative 4 – Non-lethal Deer Damage Management only by WS
- Alternative 5 – Integrated Deer Damage Management Program (Preferred Alternative)

3.2 Alternatives Considered, Including the Preferred Alternative

Alternative 1: No Deer Damage Management by WS

This alternative would eliminate WS involvement in all deer damage management activities. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own deer damage management without WS input.

Alternative 2: Technical Assistance Only (No Action Alternative)

This alternative would only allow MD/DE/DC WS to provide technical assistance to individuals or agencies requesting deer damage management. Individuals might choose to implement WS lethal and non-lethal recommendations, implement methods not recommended by WS, use contractual services of private businesses, or take no action.

Alternative 3: Lethal Deer Damage Management only by WS

Under this alternative, WS would provide only lethal direct control services and technical assistance. Requests for information regarding non-lethal management approaches would

be referred to the DNREC, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS lethal recommendations, implement non-lethal methods or other methods not recommended by WS, contract for WS lethal direct control services, use contractual services of private businesses, or take no action.

Alternative 4: Non-lethal Deer Damage Management only by WS

This alternative would require WS to use and recommend non-lethal methods only to resolve all deer damage problems. Requests for information regarding lethal management approaches would be referred to the DNREC, local animal control agencies, or private businesses or organizations. Persons incurring deer damage could still resort to lethal methods or other methods not recommended by WS, use contractual services of private businesses that were available to them, or take no action.

Alternative 5: Integrated Deer Damage Management Program (Preferred Alternative)

Under this alternative, Wildlife Services would implement a damage management program that responds to requests for white-tailed deer damage assistance in the State of Delaware. An IWDM approach would be implemented in consultation and coordination with the DNREC to alleviate white-tailed deer damage to agriculture, property, natural resources, and human health and safety on all private and public lands of Delaware where a need exists, a request is received, and funding is available. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, white-tailed deer, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, habitat modifications, harassment, repellants, and physical exclusion could be recommended and utilized to reduce deer damage. In other situations, deer would be removed as humanely as possible by sharpshooting and live capture followed by euthanasia under permits issued by the DNREC. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Deer damage management would be conducted in the state, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All deer damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

3.3 Deer Damage Management Strategies and Methodologies Available to WS

The strategies and methodologies described below include those that could be used or recommended under Alternatives 2, 3, 4, and 5 described above. Alternative 1 would terminate both WS technical assistance and operational deer damage management by

WS. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

3.3.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective¹ manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (i.e., restricting flying times, no feeding policy), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.3.2 Technical Assistance Recommendations

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. Technical assistance is generally provided following an on-site visit or verbal consultation with the requester. WS personnel provide technical assistance such as information, instructional sessions, demonstrations and advice on available deer damage management techniques. Technical assistance includes demonstrations on the proper use of management devices (pyrotechnics, exclusion devices, etc.), wildlife habits and biology, habitat management, exclusion, and animal behavior modification. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. Technical assistance may require substantial effort by WS personnel in the decision making process, but the actual work is the responsibility of the requester.

Under APHIS NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving wildlife damage problems.

3.3.3 Direct Operational Damage Management Assistance

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when Agreements for Control or other comparable instruments provide for WS direct damage management. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, if the problem is complex.

¹ The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns

3.3.4 Education

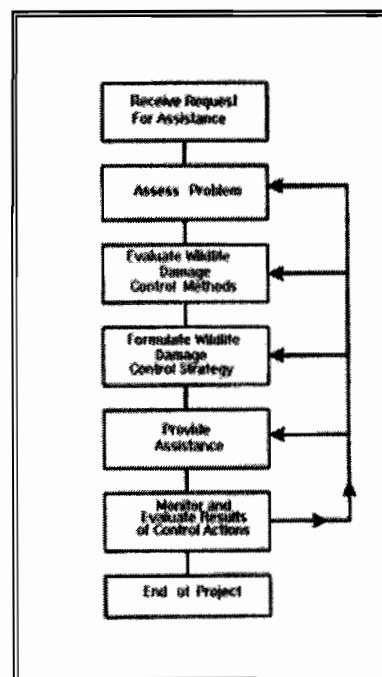
Education is an important element of WS's program activities because wildlife damage management is about finding "balance" or co-existence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to farmers, homeowners, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are updated on recent developments in damage management technology, laws and regulations, and agency policies.

3.3.5 WS Decision Making

The procedures used by WS personnel to determine management strategies or methods applied to specific damage problems can be found in USDA 1997, Appendix N.

WS personnel use a methodical process for evaluating and responding to damage complaints and requests for assistance that are depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem and evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management may be ended. In some cases, continual conduct of effective wildlife damage management activities is necessary to relieve damage. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the ongoing damage management strategy. The Decision Model is not necessarily a written process, but a mental problem-solving process common to most, if not all professions.

Figure 3-1
WS Decision Model



3.3.6 Community-based Selection of a Deer Damage Management Program

Technical assistance provided by WS to resource owners for selection of a deer damage management program: The WS program in Delaware follows the “Co-managerial approach” to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of white-tailed deer and effective, practical, and reasonable methods available to reduce deer damage to local requesters. This includes non-lethal and lethal methods. WS and other state and federal wildlife or wildlife damage management agencies may facilitate discussions at local community meetings when resources are available. Resource owners/managers and others directly affected by deer damage or conflicts in Delaware have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations. Local authorities decide which methods should be used to solve a wildlife/human conflict. These decision makers include community leaders, private property owners/managers, and public property owners/managers.

Community selection of a deer damage management program: The authority that selects damage management actions for the local community might be a mayor, city council, common council, park board, or for a homeowner or civic association would be the President or the President’s or Board’s appointee. These individuals are often times popularly elected residents of the local community who oversee the interests and business of the local community. These individuals would represent the local community’s interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision making. Identifying the authority that selects damage management actions for local business communities is more complex because the lease may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing board. WS would provide technical assistance to the local community or local business community authority(ies) and recommendations to reduce damage. Direct damage management would be provided by WS if requested by the local community authority, funding was provided, and the requested direct damage management was consistent with WS recommendations, policy and federal and state laws.

Private property selection of a deer damage management program: When one person privately owns a parcel of property, the authority selecting the damage management plan would be him or herself. WS would provide technical assistance and recommendations to this person to reduce damage. If multiple property owners are affected and no homeowner or civic association represents the affected resource owners of the local community, then WS would provide technical assistance to the self or locally appointed authority(ies). Direct damage management would be provided by WS if requested, funding was provided, and the requested direct damage management was consistent with WS recommendations, policy and federal and state laws. The affected resource owners would include those receiving damage and those whose property is adjacent to the areas where the deer primarily inhabit or damage resources. Affected resource owners who disagree with the direct damage management may request WS not conduct this action on

their property and WS will honor this request; unless, as according to State law, the DNREC has an animal health emergency and has requested WS involvement.

Public property selection of a deer damage management program: The authority selecting the damage management plan for local, state, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals and legal mandates for the property. WS would provide technical assistance and recommendations to this person to reduce damage. WS would provide direct damage management if it was requested, funding was provided, and the requested direct damage management was consistent with WS recommendations, policy, and federal and state laws.

Summary for community selection of a deer damage management program: This process for involving local communities and local stakeholders in the decisions for deer damage management assures that local concerns are considered before individual damage management actions are taken.

3.4 Wildlife Damage Management Methods Recommended or Authorized for Use

USDA (1997, Appendix J) describes methods currently used by the WS program. Several of these were considered in this assessment because of their potential use in reducing deer damage to agriculture, property, natural resources, and human health and safety. A listing and more detailed description of the methods used by MD/DE/DC WS for deer damage management is found in Appendix B of this EA.

3.4.1 Nonlethal Methods

Resource management: This method involves managing existing resources to discourage or eliminate the attractiveness of an area to deer or to minimize the likelihood that there will be conflict. Examples of this method include changes in human behavior (e.g., restructuring peak aircraft landing and takeoff times to avoid periods of high deer presence), habitat modification, livestock management, and modifying crop cultural practices (e.g., reducing vegetative cover, forage crops, or using less palatable landscape plants).

Physical exclusion: Fencing, netting, or other barriers can limit deer access to a particular area. There are several types of fences that can inhibit deer access including: temporary electric, high tensile electric, woven wire, chain-link, and solid wall fencing.

Behavior modification: The proper and integrated use of harassment techniques including auditory scaring techniques (pyrotechnics, propane exploders, electronic distress sounds, sirens, etc.) and visual scaring techniques (mylar ribbon, balloons, effigies, flashing lights, etc.) could help reduce conflicts.

Repellents: Repellents fall under two categories, contact repellants and area repellants. Contact repellents (Deer Away[®] and Miller's Hot Sauce[®]) are those repellents that are

applied to vegetation to discourage deer from browsing. Area repellents (Hinder[®] and Ro-pel[®]) are designed to repel deer by odor alone.

3.4.2 Lethal Methods

Sharpshooting: This method requires selectively shooting deer from tree stands, vehicles, or vantage points. When possible, deer killed by WS are donated for processing and distribution to charitable food organizations.

Live-capture and euthanasia: In some areas sharpshooting may be inappropriate due to safety concerns. Capture methods for deer include: darting with capture drugs, clover traps, box traps, drop nets, and rocket nets. Captured deer would be euthanized by methods recommended by the AVMA (Beaver et al. 2001) or per the recommendations of a veterinarian.

Hunting programs: WS may recommend the use of state regulated firearm and archery deer hunting programs to reduce deer damage in a local area.

3.5 Alternatives Considered But Not Analyzed in Detail With Rational

3.5.1 Live Trapping and Relocation

Under this alternative WS would capture deer alive using cage-type live traps or capture drugs administered by dart gun and then relocate the captured deer to another area. Numerous studies have shown that live-capture and relocation of deer is relatively expensive, time-consuming and inefficient (Ishmael and Rongstad 1984, O'Bryan and McCullough 1985, Diehl 1988, Jones and Witham 1990, Ishmael et al. 1995). Population reduction achieved through capture and relocation is labor intensive and would be costly (\$273-\$2,876/deer) (O'Bryan and McCullough 1985, Bryant and Ishmael 1991). Additionally, relocation frequently results in high mortality rates for deer (Cromwell et al. 1999, O'Bryan and McCullough 1985, Jones and Witham 1990, Ishmael et al. 1995). Deer frequently experience physiological trauma during capture and transportation, (capture myopathy) and deer mortality after relocation, from a wide range of causes within the first year, has ranged from 25-89% (Jones and Witham 1990, Mayer et al. 1993). O'Bryan and McCullough (1985) found that only 15% of radio-collared black-tailed deer that were live-captured and relocated from Angel Island, California, survived for one year after relocation. Although relocated deer usually do not return to their location of capture, some do settle in familiar suburban habitats and create nuisance problems for those communities (Bryant and Ishmael 1991). High mortality rates of relocated deer, combined with the manner in which many of these animals die, make it difficult to justify relocation as a humane alternative to lethal removal methods (Bryant and Ishmael 1991). Chemical Capture methods require specialized training and skill. A primary limitation of darting, the limited range at which deer can be effectively hit, is generally less than 40 yards. With modern scoped rifles, however, a skilled sharpshooter can hit the head or neck of a deer for a quick kill out to 200 yards and beyond (although a shot over 200 yards is not very likely). Thus, chemical capture is far less efficient, more labor intensive, and much more costly than lethal removal with rifles.

Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, potential for disease transfer and difficulties in adapting to new locations or habitats. Also many states no longer permit the interstate transfer of deer due to recent concerns of chronic wasting disease outbreaks. If CWD is already present in Delaware relocating deer within the state could serve to vector the disease.

3.5.2 Population stabilization through birth control

Reproductive control is often considered for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (longevity, age at onset of reproduction, population size and biological/cultural carrying capacity, etc.), habitat and environmental factors (isolation of target population, cover types, and access to target individuals, etc.), socioeconomic and other factors. Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species.

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible, initial treatment usually followed by a booster and annual follow-up treatments). Sterilization could be accomplished through: 1. Surgical sterilization (vasectomy, castration, and tubal ligation), 2. Chemosterilization, and 3. Gene therapy. Contraception could be accomplished through: 1. Hormone implantation (synthetic steroids such as progestins), 2. Immunocontraception (contraceptive vaccines), and 3. Oral contraception (progestin administered daily). Research into the use of these techniques would consist of laboratory/pen experimentation to determine and develop the sterilization or contraceptive material or procedure, field trials to develop the delivery system, and field experimentation to determine the effectiveness of the technique in achieving population reduction.

The use of hormones was investigated (Matschke 1976, 1977 a, b, c, 1980, and Roughton 1979), and eventually rejected as an effective and efficient reproductive control technique for deer. Additionally, concerns related to costs and logistics of widespread distribution of drugged baits, dosage control and ingestion of baits by children and nontarget animals make oral contraception (by steroids) largely impractical (Lowery et al. 1993). More recently, Immunocontraception has been studied in various situations and locations, but its potential use appears limited due to considerable constraints regarding treatment and follow-up treatment of a sufficiently large number of target animals, varying immunogenicity of vaccines, genetic backgrounds of individual animals, age, nutritional status, stress and other factors (Becker et al. 1997, Becker et al. 1999). The use of porcine zona pellucida (PZP) as a contraceptive agent in wildlife management has been investigated recently (Kirkpatrick et al. 1990, Turner and Kirkpatrick 1991, Turner et al. 1992, and Turner et al. 1996), but to date, there is no published documentation that

immunocontraceptive vaccines have successfully reduced any free-ranging white-tailed deer herd or population.

USDA National Wildlife Research Center (NWRC) scientists have developed GonaCon™, a new single dose immunocontraceptive vaccine that shows great promise as a wildlife infertility agent. Recent studies have demonstrated the efficacy of this single-shot GnRH vaccine on California ground squirrels, Norway rats, feral cats and dogs, feral swine, wild horses and white-tailed deer. Infertility among treated female swine and white-tailed deer lasted up to 2 years without requiring a booster vaccination (Miller et al. 2000). This vaccine overcomes one of the major obstacles of previous two dose vaccines, the need to only capture animals once to vaccinate them. A single-injection vaccine is much more practical as a field delivery system for use on free-ranging animals.

Ongoing studies initiated by NWRC in 2004, are examining the practicality of administering GonaCon™ to free-ranging white-tailed deer as well as the efficacy, toxicity and safety of the vaccine. No fertility control agents have been approved by FDA for non-investigational use on wildlife populations in the U.S. Several materials, however, including GnRH and PZP vaccines, have been classified as investigational drugs that may be used only in rigidly controlled research studies. NWRC studies that are underway at several locations are being conducted as pivotal studies that are required as part of FDA's approval process for a new animal drug.

The single-shot, multiyear vaccine will be a useful technique for the management of enclosed or urban/suburban deer populations. However, GonaCon™ still has limitations, especially the need to capture and inject each animal. Scientists are hopeful that the GnRH vaccine will soon be approved for wildlife fertility control. If and when this vaccine is proven effective and safe to use for free-ranging white-tailed deer in Delaware, this EA and its analysis would be supplemented pursuant to NEPA at that time.

Turner et al. (1993) noted that although contraception in white-tailed deer may be used to limit population growth, it will not reduce the number of deer in excess of the desired level in many circumstances. They further contend that initial population reductions by various other means may be necessary to achieve management goals, and that reproduction control would be one facet of an integrated program. In sum, although immunocontraceptive technology has been variously effective in laboratories, pens, and in island field applications, it has not been effective in reducing populations of free-ranging white-tailed deer.

The use of this method would be subject to approval by Federal and State Agencies. This alternative was not considered in detail because:

- it would take a number of years of implementation before the deer population would decline and therefore, damage would continue at the present unacceptable levels for a number of years;
- surgical sterilization would have to be conducted by licensed veterinarians, and would therefore be extremely expensive;

- it is difficult, time-consuming, and expensive to effectively live trap, chemically capture, or remotely treat the number of deer necessary to effect an eventual decline in the population; and
- State and Federal regulatory authorities have approved no chemical or biological agent for use as a deer contraceptive.

3.6 Standard Operating Procedures for Wildlife Damage Management Techniques

The current WS program, nationwide and in Delaware uses standard operating procedures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997). Some key Standard Operating Procedures are listed in the following table.

| Standard Operating Procedures | WS ALTERNATIVES | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|--------|-----------|-----------------------------|
| | No Involve-ment | Tech. Asst. | Lethal | Nonlethal | IWDM: No Action (Preferred) |
| Animal Welfare and Humaneness of Methods Used by WS | | | | | |
| Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate. | | | X | X | X |
| The Decision Model (Slate et al. 1992) is used to identify effective biological and ecologically sound deer damage management strategies and their impacts. | | | X | X | X |
| As appropriate, euthanasia procedures approved by the AVMA that cause minimal pain are used for live animals. | | | X | | X |
| The use of newly developed, proven nonlethal methods would be encouraged when appropriate. | | | | X | X |
| Drugs are used according to the Drug Enforcement Agency, FDA, and WS program policies and directives and procedures are followed that minimizes pain. | | | X | X | X |
| Safety Concerns Regarding WS Damage Management Methods | | | | | |
| The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, is used to determine deer damage management strategies. | | | X | X | X |
| All controlled substances are registered with DEA or FDA. | | | X | X | X |
| WS employees would follow approved procedures outlined in the WS Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001). | | | X | X | X |
| WS employees that use controlled substances are trained to use each material and are certified to use controlled substances under Agency certification program. | | | X | X | X |
| WS employees who use controlled substances participate in State approved continuing education to keep abreast of developments and maintain their certifications. | | | X | X | X |
| Controlled substance use, storage, and disposal conform to label instruction and other applicable laws and regulations, and Executive Order 12898. | | | X | X | X |

| | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---|---|---|
| Material Safety Data Sheets for controlled substances are provided to all WS personnel involved with specific WDM activities. | | | X | X | X |
| Concerns about Impacts of Damage Management on Target Species, T&E Species, Species of Special Concern, and Non-target Species | | | | | |
| WS consulted with the USFWS and the DNREC regarding the nation-wide program and would continue to implement all applicable measures identified by the USFWS and the DNREC to ensure protection of T&E species. | | | X | X | X |
| Management actions would be directed toward localized populations or groups and/or individual offending animals. | | | X | X | X |
| WS personnel are trained and experienced to select the most appropriate methods for taking targeted animals and excluding non-target species. | | | X | X | X |
| WS would initiate informal consultation with the USFWS following any incidental take of T&E species. | | | X | X | X |
| WS take is monitored by number of animals by species with overall populations or trends in population to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4). | | | X | | X |

CHAPTER 4: CONSEQUENCES OF THE DEER DAMAGE MANAGEMENT PROGRAM

This chapter provides information for making informed decisions on the deer damage management program outlined in Chapter 1, the issues and affected environments discussed in Chapter 2, and on cumulative impacts.

The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997). Magnitude is described in USDA (1997) as “. . . a measure of the number of animals killed in relation to their abundance.” Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage.

Impacts from this management plan may be unforeseen, cumulative, or unavoidable. Such effects are discussed in relationship to each of the wildlife species and the resulting environmental impacts are analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Analysis of the MD/DE/DC WS “takes” during past management activities and anticipated future activities, in combination with other mortality, indicates that cumulative impacts are not adversely affecting the viability and health of wildlife populations. It is not anticipated that the WS program would result in any adverse cumulative impacts to T&E species, and deer damage management activities do not jeopardize public health and safety.

4.1 Analysis of Social Consequences and Resource Use

This section analyzes the environmental consequences using Alternative 2 as the No Action alternative and therefore will be used as the baseline when comparing the other alternatives to determine if the real or potential impacts are greater, lesser or the same (Table 4-2). The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with the Council on Environmental Quality (CEQ) (1981).

4.1.1 Social and Recreational Concerns

These concerns are discussed throughout the document as they relate to issues raised during public involvement, and they are discussed in USDA (1997).

4.1.2 Irreversible and Irretrievable Commitments of Resources

The following resource values within Delaware would not be adversely impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the MD/DE/DC WS program produces very negligible impacts on the supply of fossil fuels and electrical energy.

4.2 Alternatives Analyzed in Detail by Potential Impacts

Six key potential impacts of this program have been identified, and each of these impacts is discussed for each alternative. The six impacts include: effects on white-tailed deer populations; effects on plants and other wildlife species, including T&E species; effects on human health and safety; humaneness of methods to be used; effects on aesthetic values, and effects on regulated white-tailed deer hunting.

As described in section 2.1.4, in those situations where a non-federal cooperator has obtained the appropriate DNREC permit or authority, and has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, however, certain aspects of the human environment may actually benefit more from WS's involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity; WS management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Alternative 1: No Deer Damage Management by WS

Effects on white-tailed deer populations: WS would conduct no deer damage management activities under this alternative. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Local deer populations could decline, stay the same, or increase depending on actions taken by others. Some resource/property owners may kill deer, or allow other hunters access to hunt deer, during the hunting season. Resource/property owners may also obtain special permits from the DNREC to allow them to shoot deer outside of the hunting season and in those areas where sport hunting is not allowed. Deer populations could continue to increase where hunting pressure was low or when an insufficient number of deer are removed under special permits issued by the DNREC. Some local populations of deer would temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the Preferred Alternative.

Effects on plants and other wildlife species, including T&E species: There would be no impact on non-target or T&E species by WS from this alternative. Management actions taken by non-federal entities would be considered the *environmental status quo*.

In the absence of a WS deer damage management program some resource/property owners with little or no shooting experience may attempt to remove deer. These resource/property owners could be more likely than WS personnel to take a non-target species and not report non-target take.

Damage caused by deer to wildlife species, including T&E species, may continue or increase in those situations where the resource/property owner does not implement their own deer damage management program or in those situations where a resource/property owner does not have the resources or abilities to implement an effective deer damage management program.

Effects on human health and safety: WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Potential threats to human health and safety may continue or increase in those situations where the resource/property owner does not implement their own deer damage management program; or in those situations where a resource/property owner does not have the resources or abilities to implement an effective deer damage management program.

Inexperienced resource/property owners may attempt to solve deer damage problems through trapping and shooting. Therefore, there could be increased risks to human health and safety from improper or inexperienced use of damage management methods.

Humaneness of methods to be used: WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Many people would consider this alternative humane because WS would not be involved in management actions. However, resource/property owners could use lethal and non-lethal methods to reduce deer damage. Some resource/property owners may take illegal action against localized populations of deer out of frustration of continued damage. These illegal actions may be less humane than methods used by experienced WS personnel. The humaneness of actions implemented by non-WS would be variable dependent upon the person implementing the action.

Effects on aesthetic values: WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo*.

The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Resource/property owners receiving damage from deer would likely strongly oppose this alternative because they

would bear the damage caused by deer. Some individuals would prefer this alternative because they believe it is morally wrong to kill or use animals for any reason. Some people would support this alternative because they enjoy seeing deer, or having deer nearby. However, while WS would take no action under this alternative, other individuals or entities could, and likely would, conduct deer damage management activities resulting in impacts similar to the Preferred Alternative.

Effects on regulated white-tailed deer hunting: WS would have no impact on regulated deer hunting. However, resource/property owners may remove deer under special permits issued by the DNREC resulting in impacts similar to the Preferred Alternative. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Alternative 2: Technical Assistance Only (No Action Alternative)

Effects on white-tailed deer populations: No direct deer damage management activities would be conducted by WS under this alternative. Local deer populations could decline, stay the same, or increase depending on actions taken by others. Some resource/property owners may kill deer, or allow other hunters access to hunt deer, during the hunting season. Deer populations could continue to increase where hunting pressure was low or when an insufficient number of deer are removed under special permits issued by the DNREC. Some local populations of deer would temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003), but would likely occur at a lower rate than Alternative 1 if WS advice is obtained and implemented. While WS would provide technical assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the preferred alternative.

Effects on plants and other wildlife species, including T&E species: In the absence of an integrated deer damage management program some resource/property owners with little or no shooting experience may attempt to remove deer. These resource owners would be more likely than WS personnel to take a non-target species and not report non-target take, but would likely occur at a lower rate than Alternative 1 if WS advice is obtained and implemented.

Damage caused by deer to wildlife species, including T&E species, may continue or increase in those situations where the resource owner/property owner does not implement their own deer damage management program, does not have the resources or abilities to implement an effective deer damage management program, or does not seek and implement WS technical advice.

Effects on human health and safety: Potential threats to human health and safety may continue or increase in those situations where the resource/property owner does not implement their own deer damage management program; or in those situations where a resource/property owner does not have the resources or abilities to implement an

effective deer damage management program. This increased threat would likely be less than Alternative 1 when WS recommendations are obtained and implemented.

Inexperienced resource/property owners may attempt to solve deer damage problems through trapping and shooting. Therefore, there could be increased risks to human health and safety from improper or inexperienced use of damage management methods. This increased risk would likely be less than Alternative 1 when WS recommendations are obtained and implemented.

Humaneness of methods to be used: Many people would consider this alternative humane because WS would not directly implement any deer control measures. Resource/property owners could use lethal and non-lethal methods recommended by WS to reduce deer damage or implement their own control methods without WS assistance. Some resource/property owners may take illegal action against localized populations of deer out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by experienced WS personnel. The humaneness of actions implemented by non-WS would be variable dependent upon the person implementing the action.

Effects on aesthetic values: The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Resource/property owners receiving damage from deer would likely strongly oppose this alternative because they would bear the damage caused by deer. Some individuals would prefer this alternative because they believe it is morally wrong to kill or use animals for any reason. Some people would support this alternative because they enjoy seeing deer, or having deer nearby. However, while WS would take no direct action under this alternative, other individuals or entities could, and likely would, conduct deer damage management activities resulting in impacts similar to the Preferred Alternative.

Effects on regulated white-tailed deer hunting: WS would have no direct impact on regulated deer hunting. However, resource/property owners may remove deer under special permits issued by the DNREC resulting in impacts similar to the preferred alternative.

Alternative 3: Lethal Deer Damage Management Only by WS

Effects on white-tailed deer populations: This alternative could result in a decrease in the local deer population at the specific site where the damage management occurs. Statewide, it is not anticipated that WS would kill more than 600 deer annually, on standard projects and in the event of a disease outbreak (Foot and Mouth or CWD) WS could kill up to 2,000 deer (at the request of the DNREC). Therefore, the impacts on deer populations are expected to be similar to those described in the Preferred Alternative. New deer would likely re-inhabit the site as long as suitable habitat exists. The amount of time until new deer move into the area would vary depending on the habitat type, time of year, and population densities in the area.

Effects on plants and other wildlife species, including T&E species: WS take of non-target species is expected to be minimal or non-existent. WS impacts would be similar to

those described in the preferred alternative, except in situations where lethal methods could not be used or are ineffective at reducing damage to acceptable levels. In these situations the impacts from this alternative would be similar to alternative 1.

Effects on human health and safety: The potential risks to human safety from use of lethal methods by WS would be similar to the Preferred Alternative. WS follows all firearm safety precautions when conducting damage management and complies with all laws and regulations governing the lawful use of firearms.

The reduction of deer induced human health and safety threats would be similar to those described under the Preferred Alternative, except in those situations where lethal methods could not be used or are ineffective at reducing damage to acceptable levels. In those situations impacts would be similar to alternative 1.

Humaneness of methods to be used: WS personnel are experienced and professional in their use of management methods. Methods are applied as humanely as possible. Under this alternative, deer would be killed as humanely as possible by experienced WS personnel using the most appropriate method available. Some individuals could perceive these methods as inhumane because they oppose all lethal methods of damage management. Overall impacts would be similar to the Preferred Alternative.

Effects on aesthetic values: The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. This alternative would likely be favored by resource owners who are receiving damage when lethal actions effectively reduces damage to acceptable levels, although, some resource owners would be saddened if the deer were removed. Some individuals would strongly oppose this alternative because they believe it is morally wrong to kill or use animals for any reason or they believe the benefits from deer would outweigh the associated damage. The ability to view and aesthetically enjoy deer at a particular site could be limited if the deer are removed. The opportunity to view deer is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

Effects on regulated white-tailed deer hunting: Lethal removal of deer by WS personnel would only occur after a permit has been issued by the DNREC to remove deer that are causing damage or in those situations where deer are a potential human health and safety threat or are a threat of spreading diseases. This activity would result in reduced deer densities on local project areas and may reduce densities in some project area deer management zones, hence slightly reducing the number of deer that may otherwise be available to hunters during hunting seasons. The impact of this, however, is expected to be minimal due to:

- A. the number of deer expected to be killed by WS is minimal when compared to the number taken by hunters (13.7 % of the total hunter harvest) and
- B. the number of deer expected to be killed by WS would not cause a statewide reduction in deer populations (6.67% of statewide population).

There may be some cases, where landowners have not permitted regulated deer hunting, but would allow WS employees to shoot deer. This would have only a minimal impact on deer hunting, since the land was not previously accessible to hunters. Overall impacts would be similar to the Preferred Alternative.

Alternative 4: Non-lethal Deer Damage Management Only by WS

Effects on white-tailed deer populations: WS would kill no deer under this alternative. Local deer populations could decline, stay the same, or increase depending on actions taken by others. Some resource/property owners may kill deer, or allow other hunters access to kill deer, during the legal hunting season. Deer populations could continue to increase where hunting pressure was low or when an insufficient number of deer are removed under special permits issued by the DNREC. Some local populations of deer would temporarily decline or stabilize where hunting and permitted removal activities were adequate. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). While WS could only provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the Preferred Alternative.

Effects on plants and other wildlife species, including T&E species: In the absence of an integrated deer damage management program by WS that includes the option of lethal removal of deer from damage sites, some resource/property owners with little or no shooting experience may attempt to remove deer. These inexperienced resource/property owners would be more likely than WS personnel to take a non-target species and not report non-target take. WS take of non-target species is expected to be minimal or nonexistent. The effects of WS use of non-lethal methods would be similar to those described under the Preferred Alternative.

WS impacts would be similar to those described in the preferred alternative, where nonlethal methods are effective at reducing damage to acceptable levels. When nonlethal methods are ineffective at reduce damage to acceptable levels and resource/property owners do not implement their own lethal control methods, damage caused by deer to wildlife species, including T&E species, may increase in those situations. In these situations impacts would be similar to alternative 1.

Effects on human health and safety: Concerns regarding WS use of lethal methods would be alleviated under this alternative. However, non-WS personnel would likely conduct lethal control actions that would not be available by WS resulting in impacts similar to alternative 1. Resource/property owners may attempt to lethally resolve deer damage problems through illegal use of chemicals/pesticides, trapping, and shooting. In these situations there may be some risk to human health and safety from improper or inexperienced use of these methods. The potential risks to human safety from use of non-lethal methods by WS would be similar to the Preferred Alternative.

Non-lethal methods would not be efficient or successful in resolving many deer damage situations. There are potential for increased threats to human health and safety when

non-lethal methods are ineffective and non-WS personnel do not effectively reduce local deer herds. The reduction of deer induced human health and safety threats would be similar to those described under the Preferred Alternative in those situations where non-lethal methods are effective at reducing damage to acceptable levels. In those situations where non-lethal methods are ineffective impacts would be similar to alternative 1.

Humaneness of methods to be used: WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Some individuals may perceive this approach as humane because they oppose all lethal methods of damage management. However, due to non-lethal methods being ineffective in many circumstances, resource/landowners owners may take illegal action against some local populations of deer out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by WS personnel. While WS could only provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management with impacts similar to alternative 1.

Effects on aesthetic values: The impacts of this alternative to stakeholders would be variable depending on the damage management efforts employed by resource/property owners, their values toward deer and compassion for their neighbors. Resource/property owners who are receiving damage from deer would likely oppose this management alternative when non-lethal methods are ineffective. Some people would support this alternative because they believe resource owners would do little to remove deer. Others would oppose this alternative because they believe resource/property owners would use illegal, inhumane, or environmentally unsafe methods. While WS could only provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the Preferred Alternative.

Effects on regulated white-tailed deer hunting: WS would have no impact on regulated deer hunting since WS would not lethally remove deer under this alternative. However, resource/property owners may remove deer under special permits issued by the DNREC resulting in impacts similar to the Preferred Alternative.

Alternative 5: Integrated Deer Damage Management Program (Preferred Alternative)

Effects on white-tailed deer populations: The MD/DE/DC WS program expects that no more than 600 deer would be lethally removed annually, under permits issued by the DNREC, while conducting WS direct control activities within the state. However, in the event of a disease outbreak (Foot and Mouth or CWD) WS could kill up to 2,000 deer (at the request of the DNREC). Therefore, 2,000 deer was used to analyze WS potential impacts to the statewide deer population in Delaware.

The authority for management of resident wildlife species is the responsibility of the DNREC, and deer are classified as protected big game. The DNREC collects and compiles information on white-tailed deer population trends and take, and uses this information to manage deer populations. This information has been provided to WS to assist in the analysis of potential impacts of WS activities on white-tailed deer populations in Delaware.

Currently, the DNREC estimates that there are about 30,000 deer statewide in Delaware and the population is increasing (Per. Comm. DNREC Deer Project Staff 2005). The Delaware deer population is estimated from harvest trend analysis, and monitoring vital statistics of the deer herd (Per. Comm. DNREC Deer Project Staff 2005).

The ADC FEIS (USDA 1997) determined using qualitative information (population trend indicators and harvest data) that if WS white-tailed deer kill is less than or equal to 33% of the total harvest, the magnitude is considered low. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. Using the 2004-2005 hunter harvest (14,584), 2203 taken under State issued depredation permits, and the potential lethal take of 2,000 deer annually by WS (in case of a disease outbreak), the magnitude of WS impacts on deer populations in Delaware is considered low. Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in the Delaware deer population (Per. Comm. DNREC Deer Project Staff 2005).

In those situations where a non-federal cooperator has obtained the appropriate DNREC permit or authority, and has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*.

Effects on plants and other wildlife species, including T&E species: Direct impacts on non-target species occur if WS program personnel were to inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species.

WS personnel are trained and experienced to select the most appropriate tools and methods for taking target animals and excluding non-targets. WS take of non-target species is expected to be minimal or nonexistent. Other wildlife populations would not be negatively affected, except for the occasional scaring effect from the sound of gunshots and non-lethal harassment methods. In these cases, birds and other mammals may temporarily leave the immediate vicinity, but would most likely return after conclusion of the action. Shooting is virtually 100% selective for the target species; therefore no adverse impacts are anticipated from use of this method. WS personnel set traps in locations that are conducive to capturing target animals while minimizing potential impacts to non-target species. Any non-target species captured unharmed in a live trap would be subsequently released on site.

Any operational uses of capture, sedating or euthanasia drugs would be used in accordance with applicable laws and regulations regulating their use. Adherence to these laws and regulations should avoid unreasonable adverse effects on the environment. Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible effects on the environment (USDA 1997).

WS has requested and obtained the USFWS and DNREC list of Endangered, Threatened and Special Concern species in Delaware. WS will periodically consult with the USFWS and DNREC to ensure that actions taken under this plan will not adversely affect DE listed species.

Federally Listed Species. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the ESA concerning potential impacts of wildlife damage management methods on T&E species and has obtained a Biological Opinion (USDI 1992). For the full context of the Biological Opinion, see Appendix F of the ADC Final EIS (USDA 1997, Appendix F). Based on the conclusions made by USFWS during their 1992 programmatic consultation of WS activities and subsequent Biological Opinion, it was determined that management activities being utilized for deer damage management in Delaware would not adversely affect T&E species listed in Delaware, except for those species listed in Table 4-1. The animal and plant species listed in Table 4-1 were not included in the 1992 programmatic consultation. Furthermore, the MD/DE/DC WS program has determined no effect on those T&E species considered extirpated from the state; those Federal T&E species listed in Table 4-1; and on those methods not included in the 1992 Biological Opinion.

Table 4-1. Federal listed Threatened and Endangered species in Delaware not included in the 1992 Biological Opinion.

| Common Name | Scientific Name | Status |
|---------------------------------|-------------------------------|---------------|
| American burying beetle | <i>Nicrophorus americanus</i> | E |
| Delmarva Peninsula fox squirrel | <i>Sciurus niger cinereus</i> | E (XN) |
| Finback whale | <i>Balaenoptera physalus</i> | E |
| Humpback whale | <i>Megaptera novaeangliae</i> | E |
| Right whale | <i>Balaena glacialis</i> | E |
| Bog turtle | <i>Clemmys muhlenbergii</i> | T |
| Dwarf wedgemussel | <i>Alasmidonta heterodon</i> | E |
| Sensitive joint-vetch | <i>Aeschynomene virginica</i> | T |
| Swamp pink | <i>Helonias bullata</i> | T |
| American chaffseed | <i>Schwalbea americana</i> | E |
| Seabeach Amaranth | <i>Amaranthus pumilus</i> | T |

E - Endangered, T - Threatened, XN - Experimental Population (Non-Essential)

State Listed Species. WS has determined that the proposed deer damage management program will not adversely affect any Delaware State listed threatened or endangered species or species of special concern (Table 4-2).

Table 4-2. State of Delaware's Endangered Species List, 2005¹

Amphibians

Salamander, Eastern Tiger (*Ambystoma tigrinum tigrinum*)
Treefrog, Barking (*Hyla gratiosa*)

Birds

Creeper, Brown^{BR} (*Certhia americana*)
Eagle, Bald (*Haliaeetus leucocephalus*)*
Grebe, Pied-billed^{BR} (*Podilymbus podiceps*)
Harrier, Northern^{BR} (*Circus cyaneus*)
Hawk, Cooper's^{BR} (*Accipiter cooperii*)
Heron, Black-Crowned Night- (*Nycticorax nycticorax*)
Heron, Yellow-Crowned Night- (*Nyctanassa violacea*)
Parula, Northern^{BR} (*Parula americana*)
Plover, Piping (*Charadrius melodus*)*
Owl, Short-eared^{BR} (*Asio flammeus*)
Oystercatcher, American (*Haematopus palliatus*)
Rail, Black (*Laterallus jamaicensis*)
Sandpiper, Upland (*Bartramia longicauda*)
Shrike, Loggerhead (*Lanius ludovicianus*)
Skimmer, Black (*Rynchops niger*)
Sparrow, Henslow's (*Ammodramus henslowii*)
Tern, Common^{BR} (*Sterna hirundo*)
Tern, Forster's^{BR} (*Sterna forsteri*)
Tern, Least (*Sterna antillarum*)
Warbler, Cerulean (*Dendroica cerulea*)
Warbler, Hooded^{BR} (*Wilsonia citrina*)
Warbler, Swainson's (*Limnothlypis swainsonii*)
Woodpecker, Red-headed (*Melanerpes erythrocephalus*)
Wren, Sedge (*Cistothorus platensis*)

Fish

Sturgeon, Atlantic (*Acipenser oxyrhynchus*)

Insects

Beetle, Little White Tiger (*Cicindela lepida*)
Beetle, White Tiger (*Cicindela dorsalis*)
Beetle, Seth Forest Scavenger (*Hydrochus* sp.)
Elfin, Frosted (*Incisalia irus*)
Firefly, Bethany (*Photuris bethaniensis*)
Hairstreak, Hessel's (*Mitoura hesseli*)
Hairstreak, King's (*Satyrrium kingi*)
Skipper, Rare (*Problema bulenta*)
Wing, Mulberry (*Poanes massasoit chermocki*)

^{BR} Breeding population only.

Mammals

Squirrel, Delmarva Fox (*Sciurus niger cinereus*)*

Mollusks

Lampmussel, Yellow (*Lampsilis cariosa*)

Lampmussel, Eastern (*Lampsilis radiata*)

Wedgemussel, Dwarf (*Alasmidonta heterodon*)*

Pondmussel, Eastern (*Ligumia nasuta*)

Floater, Brook (*Alasmidonta varicosa*)

Mucket, Tidewater (*Leptodea ochracea*)

Reptiles

Sea Turtle, Leatherback (*Dermochelys coriacea*)*

Sea Turtle, Atlantic Ridley (*Lepidochelys kempii*)*

Sea Turtle, Green (*Chelonia mydas*)*

Sea Turtle, Loggerhead (*Caretta caretta*)*

Turtle, Bog (*Clemmys muhlenbergii*)*

Snake, Corn (*Elaphe guttata guttata*)

¹ Delaware Wildlife and Non-Tidal Fishing Regulations, Oct. 10, 2002 List includes both Federal and State Listed Species.

* Federal Listed Species

WS could benefit listed species by reducing deer browsing damage to listed plant species and to habitats of listed animal species. This alternative would likely reduce the damaging effects that deer are having on native flora and fauna, including the recovery of threatened and endangered species to acceptable levels since all damage management methods could be considered for potential use.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS management activities may have less of an impact non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Effects on human health and safety: This alternative would have the greatest potential to reduce threats to public health and safety from a site by alleviating potential threats of transmitting diseases, and potential deer/aircraft and deer/vehicle collisions since all available lethal and nonlethal methods could be considered for use or recommended.

WS's deer damage management methods pose minimal or no threat to human health and safety. A formal risk assessment of WS' operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse affects on human safety from WS' use of deer damage management methods is expected.

Shooting with shotguns or rifles, or the use of controlled substances (immobilization and euthanasia drugs) would be used to reduce deer damage when lethal methods are determined to be appropriate. WS could use firearms to euthanize deer captured in live traps. WS follows safety precautions when conducting damage management activities and complies with all applicable laws and regulations governing the lawful use of management methods, including firearms and controlled substances. WS' traps are strategically placed to minimize exposure to the public. Appropriate signs are posted on all properties where traps are set to alert the public of their presence.

The use of firearms can be a politically sensitive issue because of the occasional carelessness and misuse of firearms by people. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety-and-use training program within three months of their appointment and a refresher course every two years afterwards (WS Directive 2.615). WS employees, who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment*.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Humaneness of methods to be used: WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Damage management methods viewed by some persons as inhumane would be employed by WS under this alternative. These methods would include shooting, trapping, and immobilization/euthanasia drugs. Under this alternative, deer would be shot or captured as humanely as possible by experienced WS personnel using the best method available. Deer live-captured would be subsequently euthanized. Some individuals may perceive these methods as inhumane because they oppose all lethal methods of damage management. However, this alternative allows WS to consider non-lethal methods, and WS would implement non-lethal methods for deer damage management when appropriate.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Effects on aesthetic values: The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Most resource owners who are incurring damage would likely favor this alternative as it allows for an IWDM approach to resolving damage problems. The proposed IWDM

approach allows for the use of the most appropriate damage management methods. Most stakeholders without damage would also prefer this alternative to Alternative 3, where all deer are killed, because non-lethal methods could be appropriate to resolve damage problems in some situations. Some individuals would strongly oppose this alternative, and most action alternatives, because they believe it is morally wrong to kill or use animals for any reason or they believe that the benefits from deer outweigh the associated damage.

The ability to view and aesthetically enjoy deer at a particular site could be limited if the deer are removed. New deer, however, would likely use the site in the future, although the length of time until new animals arrive is variable, depending on the habitat, time of year, and population densities in the area. The opportunity to view deer is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

Public reaction would be variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife. An IWDM approach, which includes non-lethal and lethal methods, provides relief from damage or threats to human health or safety to those people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by problems and threats to human health or safety caused by deer insist upon their removal from the property or public location when the wildlife acceptance capacity is reached or exceeded. Some people will have the opinion that deer should be captured and relocated to a rural area to alleviate damage or threats to human health or safety. Some people would strongly oppose removal of the deer regardless of the amount of damage. Individuals not directly affected by the threats or damage may be supportive, neutral, or totally opposed to any removal of deer from specific locations or sites. Some people that totally oppose lethal damage management want WS to teach tolerance for deer damage and threats to public health or safety, and that deer should never be killed.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Effects on regulated white-tailed deer hunting: Lethal removal of deer by WS personnel would only occur after a permit has been issued by the DNREC to remove deer that are causing damage or in those situations where deer are a potential human health and safety threat or are a threat of spreading diseases. This activity would result in reduced deer densities on local project areas and may reduce densities in some project area deer management zones, hence slightly reducing the number of deer that may otherwise be available to hunters during hunting seasons. The impact of this activity, however, is expected to be minimal due to:

- A. the number of deer expected to be killed by WS is minimal when compared to the number taken by hunters (13.7 % of the total hunter harvest) and
- B. the number of deer expected to be killed by WS would not cause a statewide reduction in deer populations (6.67% of statewide population).

There may be some cases, where landowners have not permitted regulated deer hunting, but would allow WS employees to shoot deer. This would have a minimal impact on deer hunting, since the land was not previously accessible to hunters.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*.

4.3 Cumulative Impacts

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Cumulative Impacts on Wildlife Populations

Deer damage management methods used or recommended by the WS program will likely have no cumulative adverse effects on target and non-target wildlife populations. WS limited lethal take of white-tailed deer is anticipated to have minimal impacts on overall deer populations in Delaware. When control actions are implemented by WS the potential lethal take of non-target wildlife species is expected to be minimal to non-existent.

Cumulative Impact Potential from Chemical Components

Repellants and immobilization/euthanasia drugs may be used or recommended by WS. Characteristics and use patterns of these methods indicate that no significant cumulative impacts are expected from their use in WS deer damage management programs.

Cumulative Impact Potential from Non-chemical Components

Non-chemical methods used or recommended by WS may include exclusion, habitat modification, trapping, harassment methods and shooting. No cumulative impacts from WS use of these methods are expected.

SUMMARY

No significant cumulative environmental impacts are expected from any of the 5 alternatives.

Under the Preferred Alternative and Alternative 3, the lethal removal of deer by WS would not have a significant impact on overall deer populations in Delaware, but some local reductions may occur. This is supported by the DNREC, which is the agency with

responsibility for managing wildlife in the State. No risk to public safety is expected when WS' services are provided and accepted by requesting individuals in Alternatives 2, 3, 4, and 5 since only trained and experienced WS personnel would conduct and recommend deer damage management activities. There is a slight increased risk to public safety when a person rejects WS assistance and recommendations in Alternatives 2, 3, 4, and 5.

Under Alternative 1, management actions taken by non-federal entities would be considered the *environmental status quo*. In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage white-tailed deer to stop damage with or without WS assistance in Alternatives 2, 3, 4 and 5, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Although some persons will likely be opposed to WS' participation in deer damage management activities, the analysis in this EA indicates that WS IWDM program will not result in significant, cumulative, adverse impacts on the quality of the human environment.

Table 4-2 Comparisons of Issues/Impacts and Alternatives

| Issues/Impacts | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 5 |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Effects on white-tailed deer populations | No impact by WS. If resource owner conducts lethal deer management, effect would be similar to Alternative 5. | No impact by WS. If resource owner conducts lethal deer management, effect would be similar to Alternative 5. | Local population would be reduced and sustained at a lower level. No adverse affect on statewide deer population. | WS would not affect population. If resource owner conducts lethal deer management, effect would be similar to Alternative 5. | Local population would be reduced and sustained at a lower level. No adverse affect on statewide deer population. |
| Effects on plants and other wildlife species, including T&E species | No impact by WS. Positive impact to those species that are being negatively impacted by deer if resource owner implements effective damage reduction program. | No impact by WS. Positive impact to those species that are being negatively impacted by deer if resource owner implements effective damage reduction program. | No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer if lethal methods are effective. | No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer if nonlethal methods are effective. | No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer. |
| Effects on human health and safety | No impact by WS. If resource owners conduct deer damage management, effect would be variable. | No impact by WS. If resource owners conduct deer damage management, effect would be variable. | No adverse impact by WS. Low risk from methods used by WS. Positive effect from reduced deer strikes and disease transmission if lethal methods are effective. | No adverse impact by WS. Low risk from methods used by WS. Positive effect from reduced deer strikes and disease transmission if nonlethal methods are effective. | No adverse impact by WS. Low risk from methods used by WS. Positive effect from reduced deer strikes and disease transmission. |
| Humaneness of methods to be used | Most would view as humane. If resource owners conduct deer management activities, effects would be variable. | Most would view as humane. If resource owners conduct deer management activities, effects would be variable. | Effects would be variable. Some would view as inhumane. | Most would view as humane. If resource owners conduct lethal deer management activities, effects would be variable. | Effects would be variable. Some would view as inhumane. |

| Issues/Impacts | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 5 |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Effects on aesthetic values | Population would remain the same or increase. Increased opportunity to view deer. If resource owner conducts deer damage management activities, effects would be similar to Alternative 5. Damage may not be reduced to acceptable levels. | Population would remain the same or increase. Increased opportunity to view deer. If resource owner conducts deer damage management activities, effects would be similar to Alternative 5. Damage may not be reduced to acceptable levels. | Local population would be reduced, less opportunity to view deer at damage site. Reduction in damage if WS lethal actions effective. | WS would not affect population. Population would remain the same or increase. Increased opportunity to view deer. If resource owners conduct lethal deer damage management activities effect would be similar to Alternative 5. Reduction in damage if WS nonlethal actions effective. | Local population would be reduced, less opportunity to view deer at damage site. Damage would be reduced. |
| Effects on regulated white-tailed deer hunting | No effect by WS. Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons if resource owner implements lethal control methods. | No effect by WS. Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons if resource owner implements lethal control methods. | Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons | No effect by WS. Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons if resource owner implements lethal control methods. | Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons |

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APPENDIX A

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APPENDIX B

WHITE-TAILED DEER DAMAGE MANAGEMENT METHODS RECOMMENDED or AUTHORIZED for USE by THE MD/DE/DC WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS

Resource Management

These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification that are implemented by the affected resource owner/manager. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include:

Changes in human behavior

These may include altering the flight times of departing and arriving aircraft so that flying is at a time period of low wildlife activity. This may include restricting flying during certain times of the day or restricting departures and arrivals on specific runways.

Habitat modification

Habitat modification can be an integral part of WDM. Wildlife production and/or presence are directly related to the type, quality and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain wildlife species. The resource/property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of WDM strategies at or near airports to reduce problems by eliminating loafing, bedding and feeding sites. Generally, many problems on airport properties can be minimized through management of vegetation and water on areas adjacent to aircraft runways.

Modifying or eliminating habitat utilized by deer may change deer behavior and reduce some deer-human conflicts. This could include reducing vegetative cover and forage plants used or preferred by deer. One method, to eliminate habitat, is using cattle to consume the biomass that deer and other wildlife would feed upon. Reardon and Merrill report that continuous heavy grazing by cattle or by mixed classes of livestock eliminated preferred deer foods and adversely impacts other aspects of white-tailed deer habitat (Reardon and Merrill 1976, Merrill et al. 1957, Merrill 1959). Crawford noted that livestock grazing affects the vigor and composition of plants and the direction and rapidity of plant succession. Thus, it can significantly influence carrying capacity of white-tailed deer habit (Crawford 1984).

Studies in agriculture areas of Missouri indicate cultivated crops comprised 41 percent of deer diet by volume (Beringer J. and Hansen L. P. 1997). Thus, by reducing the amount of deer preferred crops, deer densities in an area (ie. airport runways) may decrease. For example, brome grass could be chosen to replace row crops, as brome is not a highly preferred plant species by deer, relative to other cover crops (ie. alfalfa and clover) and still provides the owner with a source of revenue.

Physical Exclusion

A fence can limit the entry of deer onto affected properties. There are several types of fences that inhibit the movement of deer if properly installed, including electric fencing, woven wire, and chain link fencing. The height of a fence required to exclude deer is a much debated topic. Smith and Coggin (1984) reported that a 7-foot fence (2.1-meters) reduced deer-vehicle collisions by 44.3 to 83.9 percent along a New York Thruway. Clearly and Dolbeer (1999) recommend that airports install a 10-foot chain link fence with barbed-wire outriggers to limit deer entry. For the purpose of this EA, WS recommends a fence height of 12 feet, with an additional three feet buried below the ground, to exclude deer.

Behavior Modification

This refers to tactics that alter the behavior of wildlife to reduce damage. Effective behavior modification usually requires integrating two or more auditory scaring or visual scaring techniques.

Auditory scaring techniques

The proper use of frightening devices and harassment techniques including sirens, flashing lights, electronic distress sounds, pyrotechnics, propane exploders, dogs, and rubber projectiles fired from a shotgun could help reduce conflicts (Craven and Hygnstrom 1994). Used in the proper context, these devices can help keep deer away from conflict areas. Some disadvantages are that these methods can be labor intensive and expensive. Also, frightening methods must be continued indefinitely unless the deer population is reduced or excluded from the resource.

Pyrotechnics: Pyrotechnics are specialized fireworks that are shot out of a 12-gauge shotgun or starter's pistol to deter deer or other wildlife. To be successful, pyrotechnics should be carried by wildlife control personnel at all times and used whenever the situation warrants. Continued use of pyrotechnics, alone may lessen the effectiveness.

Propane Cannons: Propane cannons are mechanical devices that use propane gas and an igniter to produce a loud explosive sound. Propane cannons are often suggested as effective frightening agents for deer (Craven and Hygnstrom 1994), and have been used frequently in attempts to reduce crop damage and encroachment on airports. Research has shown that propane cannons detonated systematically at 8-10 minute intervals are effective in frightening deer away from protected areas for two days. Motion-activated cannons however, detonate only

when deer approach the area to be protected and have been shown to be effective up to 6 weeks. (Belant et al. 1996).

Visual scaring techniques

Visual techniques such as use of mylar tape (highly reflective surface produces flashes of light), eye-spot balloons (the large eyes supposedly give deer a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing deer damage in a localized area for a limited time period.

Repellents

Repellents have had mixed results in reducing deer damage to shrubs and trees (Palmer et al. 1983, Matschke et al. 1984, Conover 1984, Hygnstrom and Craven 1988, Andelt et al. 1991, Craven and Hygnstrom 1994). Results are generally linked to deer numbers, availability of preferred food plant species, alternate food sources, season, and weather. Commercial repellents are costly ranging from \$20/gallon to \$80/gallon.

Repellents require continuous applications and are limited in their effectiveness. The effectiveness of a topical repellent is directly related to residue present on the plant. Rain, heavy dew and watering will remove the residue requiring reapplication of the material. The use of repellents can cause a decrease in native vegetation by shifting browsing pressure from protected plants to native flora. The effectiveness of repellents decreases as deer numbers increase and available food plants decrease.

LETHAL METHODS

Sharpshooting

Studies have suggested that localized management by removing deer is an effective tool where deer are causing undesirable effects (McNulty et al. 1997). This research supports the hypothesis that the removal of a small, localized group of white-tailed deer would create a population of low density in that localized area.

WS would conduct sharpshooting, with center-fire rifles, during daylight or at night using spotlights or night-vision equipment. Rifles would be equipped with sound suppressors, to avoid disturbance, and to facilitate success by minimizing the tendency of deer to flee from the sound of gunfire. Shots would be taken from elevated positions in tree stands, in the beds of trucks, or other vantage points. Elevated positions cause a downward angle of trajectory, so that any bullets that inadvertently miss or pass through targeted deer, will hit into the ground or into earthen embankments to minimize the risk of stray bullets presenting a safety hazard to people, pets, or property. WS personnel would strive for head and neck shots when shooting deer to achieve quick, humane kills. Bait may be used to attract deer to safe sites for shooting and to enhance success and efficiency. The venison from deer killed by WS would be, when possible, processed and donated for consumption, at one or more charitable organizations. WS will be responsible for properly preparing deer and the delivery to a USDA approved meat processor.

Only WS personnel, who have completed firearms safety training, have demonstrated skill and proficiency with the firearms used for deer removal, and have been approved for sharpshooting by the MD/DE/DC State Director will participate in sharpshooting deer.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety-and-use training program within three months of their appointment and a refresher course every two years afterwards (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Live Capture and Euthanasia

Some situations restrict or do not warrant standard shooting operations. In such cases it may be appropriate to remove individual deer by trapping and euthanizing the animals. Clover traps, box traps, drop nets, and rocket nets are several methods that can be used to live capture deer.

It is also possible to live capture deer using chemical immobilization drugs. Deer that are immobilized would be subsequently euthanized. The following are immobilizing/euthanasia drugs that could be used to capture/euthanize deer:

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer. Currently, tiletamine can only be purchased as Telazol, which is a mixture of two drugs: tiletamine and zolazepam (a tranquilizer). Muscle tension varies with species. Telazol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for these wild species (Fowler and Miller 1999). This drug is sold in a powder form and must be reconstituted with sterile water before use. Once mixed with sterile water, the shelf life is four days at room temperature and 14 days if refrigerated.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound,

and touch. When using ketamine/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Fowler and Miller 1999). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

Hunting Programs

WS may recommend sport hunting as a viable damage management method when deer can be legally hunted. A valid hunting license and other licenses or permits may be required by the DNREC. This method provides sport and food for hunters and requires no cost to the landowner.